

**Work Order ID 66922**

Wednesday, March 02, 2011 2:59:10 PM



Page 1

Item ID: D350-748-101

Accept



Setup Start



Revision ID:

Item Name: Crosstube Installation, High Fwd

Stop



Start Date: 3/2/2011 Start Qty: 1.00



Cust Item ID:

Required Date: 3/23/2011 Req'd Qty: 1.00



Customer:

Reference:

Approvals:

Process Plan:

Date: 11-03-2

Tooling:

Date:

Run Start



QC:

Date:

SPC (Y/N):

Date:

Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
Draw Nbr	Revision Nbr								
D350-748-141	F  11.11.04								
100		0.00							
	DOCUMENT CONTROL								
DC	Memo	0.00							
Document Control	Photocopy bluefile & type labels per PPPD350-748-101		CHG002						
110		0.00							
	BENDING MACHINE - CROSSTUBES								
CNC Bend 1	Memo	0.00							
CNC Delta 100 Bender	Bend tube as per Dwg D350-748-141 using CNC bender program D350F and Folio FT								
120		0.00							
	QC15- Crosstube Dimensional Check								
QC	Memo	0.00							
Quality Control									

11-11-04 (1)

11-10-4

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
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QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Run Start



Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

125

0.00



HandFXtube

Memo

0.00

Hand Finishing Crosstubes

\*\*\*Stress relief\*\*\*

Heat treat crosstube as per QSI010 4.3

Temp: 375°

Start time: 4h45

Finish time: 8h45

① SAD 11-10-04

127

QC6- Inspect dimensions to drawing

0.00



QC

Memo

0.00

Quality Control

(twist is lower)

Sulcolos

**Dart Aerospace Ltd**

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Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
130	Crosstubes	0.00							
Crosstubes									
Crosstubes									
	<b>Memo</b>	0.00							
	1-Drill Tube as per Dwg D350-748-141 Using DT8876 A,B & C Drill Jigs, Set-up drill table as per QSI 010								
	2-Deburr								
	3-Engrave Part # and Batch # as per Dwg D350-748-141								
	4-Remove all marks from tube within limits of D350-748-141								
	5- Apply a light coat of LPS3 on the interior of tube Batch: <u>M109956</u>								
140	QC5- Inspect part completeness to step on W/O	0.00							
QC									
Quality Control									
	<b>Memo</b>	0.00							
	CHECK 10 DEG HOLES WITH DT8876E (EUROCOPTER CLAMP)								

**Dart Aerospace Ltd**

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Run Start



Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
150  Outsource3 Outsource process - Cad plate	Outsource process-Cadplate per QSI017 4.1.9.1  <b>Memo</b> Issue P/O: <u>15117</u> Stress relief at 375° for 5 hours Magnetic Particle Inspect per ASTM E1444 Cadium Plate per AMS-QQ-P-416B, Class 1, Type 2 Embrittle relief at 375° for 8 hours, Chromate Treat Possible Supplier: Southwest United Industries Ensure Certificate of Conformity is attached	0.00  0.00						<u>11-10-4</u>	
160  Packaging Packaging	Receive & Inspect for Damage & Mat'l Certs  <b>Memo</b> Ensure certificate of conformity is attached	0.00  0.00							<u>See W/O CHG ATTACHED</u> <u>11-11-03</u>
170  QC Quality Control	QC5- Inspect part completeness to step on W/O  <b>Memo</b>	0.00  0.00							

issue P/O to Accuron for NDT as per QSI 038 P/O: 15359  
rec'd + inspect and attached full report of NDT to W/O

CY 11/11/03

11-11-03

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Dart Aerospace Ltd

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DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector	
11.10.05	161	LOAD TUBE TO 3500 <sup>lb</sup> FOR 1 MINUTE.  REF D.S. EMAIL.  BN 66922	GP	11.11.01	1	GP 11.11.01 BSJ/KR	MM 11/11/03	
11.10.05	162	NDT TUBE.				GP 11.11.01 BSJ/KR	MM 11/11/03	

Part No: D350-748-101 PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_  
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NOTE: Date & initial all entries

## Chris Provencal

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**From:** David Shepherd <dshepherd@dartaero.com>  
**Sent:** Tuesday, April 27, 2010 3:40 PM  
**To:** 'Mike Petsche'  
**Cc:** 'Bill Beckett'; 'L Lacelle'; 'Chris Provencal'; 'Dan Stow'; ssheldon@dartaero.com  
**Subject:** 350 crosstubes

Mike,

I discussed the 350 crosstube load testing with Bill a little while ago and this plan makes sense to him.

So, my recommendation to clear these crosstubes is to load the fwd crosstubes to 3500 lb and the aft crosstubes to 3000 lb in the deflection test rig and document on the work orders that this test has been completed. Hold max load for 1 minute. Per TP-D350-748-2, these loads represent the maximum load on these crosstubes at gross weight and are below the yield point of the material. I would like to request that Chris Provencal witness these tests and sign off the work orders based on his experience with Dart landing gears. My feeling is that if there is a problem with the parts, it will manifest itself during this load test. I, for one, would feel a lot more confident in testing each crosstube in this manner than relying totally on what Exova has to say. I think it would be very difficult to reach a conclusion on the whole batch on the basis of cracks in two parts from the batch.

I believe that we can accomplish this before next Friday, which also gives us time to hear what Exova has to say in case it has an impact on our decision. So far, what I have seen from Exova shows me that there are fluctuations in the heat treating but the tubes are heat treated to our specification.

For this reason, I believe we should tell DHS that it looks like we will be able to start shipping 350 crosstubes by May 7th pending a successful Engineering test of the material.

David.

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Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
180  SprayPaint Spray Painting	SprayPaint  Memo 1-Prime inside crosstube as per QSI 005 4.2 2-Prime Outside of Tube as per Dart QSI 005 4.2	0.00  0.00						25 11-11-03	
190  QC Quality Control	QC14- Inspect Spray Paint  Memo Then, Wrap in plastic bag to protect from scratches	0.00  0.00						11-11-04	
200  Crosstubes Crosstubes	Crosstubes  Memo 1-Install Ground wire Insert, then insert screw and washer 2-Install Abraison strips as per Dwg D350-748-141 & QSI 035. 3-Install supports Using Dt8876 as per Dwg D350-748-141, Torque to 60-80 IN-LBS	0.00  0.00						25 11-11-04	

**Dart Aerospace Ltd**

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Run Start



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
210  QC Quality Control	QC5- Inspect part completeness to step on W/O  Memo	0.00  0.00					11	11	04 (1)
220  Packaging Packaging	Pick Kit  Memo	0.00  0.00					11	11	04
230  QC Quality Control	QC4- 100% Inspect kits for completeness  Memo	0.00  0.00					11	11	04 (1)

**Dart Aerospace Ltd**

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Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
240		0.00							
	Packaging								
Packaging	Memo	0.00							
Packaging	Identify and pack for shipping as per PPP D350-748-101								
	Location: _____								
	PPP Rev: _____								
250		0.00							
	QC21- Final Inspection - Work Order Release								
QC	Memo	0.00							
Quality Control									

*Handwritten signature and initials*

*Handwritten date and initials: 11/11/04 MF 11-11-04*

**Dart Aerospace Ltd**

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# Picklist Print

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Page 1

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Parent Item Name: Crosstube Installation, High Fwd




Start Date: 3/2/2011

Required Date: 3/23/2011

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev:A New Issue 06-07-05 JLM  
 IPP Rev:B Update qty of MS21042L5 06-09-12 KJ  
 IPP Rev:C Rev B 07-11-15 DD  
 IPP Rev D Combined manufacturing 08.04.02 EC verified by: DD  
 IPP Rev:E 08-06-24 revD as per dwg DD verified by:EC IPP Rev:F  
 10.08.04 added QSI010 4.3 DD verf:EC

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D350-748-141TRN 		Manufactured	No			110	Each	0.0000	1	1			
Crosstube Turning Detail													
ALS4-1032-225 		Purchased	No			200	Each	3,839.000	1	1			
Insert													
				<u>Location</u>		<u>Loc Qty</u>		<u>Loc Code</u>					
				PK011		3839							
				110768		3839							
AN960JD10 	NAS1149D0363J	Purchased	No			200	Each	24.0000	1	1			
Washer													
				<u>Location</u>		<u>Loc Qty</u>		<u>Loc Code</u>					
				ST		6							
				107715		6							
				ST335		18							
				105792		2							
				112279		16							

372336

108 696

118612

SAD 11-10-04

25 11-11-04

25 11-11-04

**Dart Aerospace Ltd**

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Start Date: 3/2/2011

Required Date: 3/23/2011

Start Qty: 1.00

Required Qty: 1.00

D2856-400

Manufactured No

200 f

158.4380

1.181

1.243158



Abraison Strip

71164



11-11-04

Location

Loc Qty

Loc Code

ST403

158.4380421

56626

0.00004211

59920

43.381

63735

115.057

D3502-1

Manufactured No

200 Each

32.0000

2

2



Support

68951



11-11-04

Location

Loc Qty

Loc Code

ST063

32

52903

1

61206

12

61843

9

64004

10

MS21920-20

Purchased No

200 Each

61.0000

2

2



Clamp (per MIL-DTL-8783C)

118649



11-11-04

Location

Loc Qty

Loc Code

LG

61

112624

2

114687

1

115736

8

116799

50

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Start Qty: 1.00

Required Qty: 1.00

MS27039-1-10

Purchased

No

200

Each

84.0000

1

1



Screw

118612



25 11-11-04

Location

Loc Qty

Loc Code

ST291

84

112794

3

115935

81

220

Each

200.0000

8

8

AN4-41A

Purchased

No



Bolt



Sp 11-11-04

Location

Loc Qty

Loc Code

ST360

200

115108

100

115705

50

116191

50

220

Each

1,674.000

16

16

AN4-6A

Purchased

No



Bolt



m 118 628 Sp 11-11-04

Location

Loc Qty

Loc Code

ST356

1674

112933

96

113149

17

115108

8

115457

253

115936

200

116191

300

116400

400

116924

400

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Required Date: 3/23/2011

Start Qty: 1.00

Required Qty: 1.00

AN5-32A

Purchased

No

220

Each

149.0000

4

4



Bolt



m118422.sp.

Location

Loc Qty

Loc Code

ST340

149

115016

38

115108

50

115589

60

115698

1

AN960JD416

NAS1149D0463J

Purchased

No

220

Each

30.0000

32

32



Washer



m119097.sp 11-11-04

Location

Loc Qty

Loc Code

ST300

24

113288

24

ST356

6

115622

6

AN960JD516

NAS1149D0563J

Purchased

No

220

Each

34.0000

8

8



Washer



m118206.sp 11-11-04

Location

Loc Qty

Loc Code

ST

34

103694

18

107534

12

109287

4

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W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_  
 Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



# Picklist Print

Wednesday, March 02, 2011 2:59:17 PM

Page 5

Work Order ID: 66922

Parent Item: D350-748-101

Parent Item Name: Crosstube Installation, High Fwd

Start Date: 3/2/2011

Required Date: 3/23/2011

Start Qty: 1.00

Required Qty: 1.00

D3500-1

Manufactured No

220

Each

37.0000

4

4

Saddle

Location

Loc Qty

Loc Code

ST243

20

62207

20

ST424

2

55605

2

ST425

15

61838

15

D3501-1

Manufactured No

220

Each

202.0000

16

16

Bushing

Location

Loc Qty

Loc Code

ST063

202

45402

15

45918

112

48268

3

53779

5

61984

67

MS21042L4

Purchased No

220

Each

4,871.000

24

24

Nut

Location

Loc Qty

Loc Code

ST300

4871

1123143

2

115589

10

115621

20

116188

2839

116823

2000

B70695 Sp 11-11-04

B73391 Sp 11-11-04

M118451 Sp 11-11-04

Wednesday, March 02, 2011 2:59:17 PM

Shop Packet Print

Page 5

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES						
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector	

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_  
 Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

# Picklist Print

Wednesday, March 02, 2011 2:59:17 PM

Page 6

Work Order ID: 66922

Parent Item: D350-748-101

Parent Item Name: Crosstube Installation, High Fwd



Start Date: 3/2/2011

Required Date: 3/23/2011

Start Qty: 1.00

Required Qty: 1.00

MS21042L5

Purchased

No

220

Each

998.0000

4

4



Nut



m118910 Sp11-11-04

Location

Loc Qty

Loc Code

ST139

26

114813

26

ST300

972

115594

276

116105

496

116548

200

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

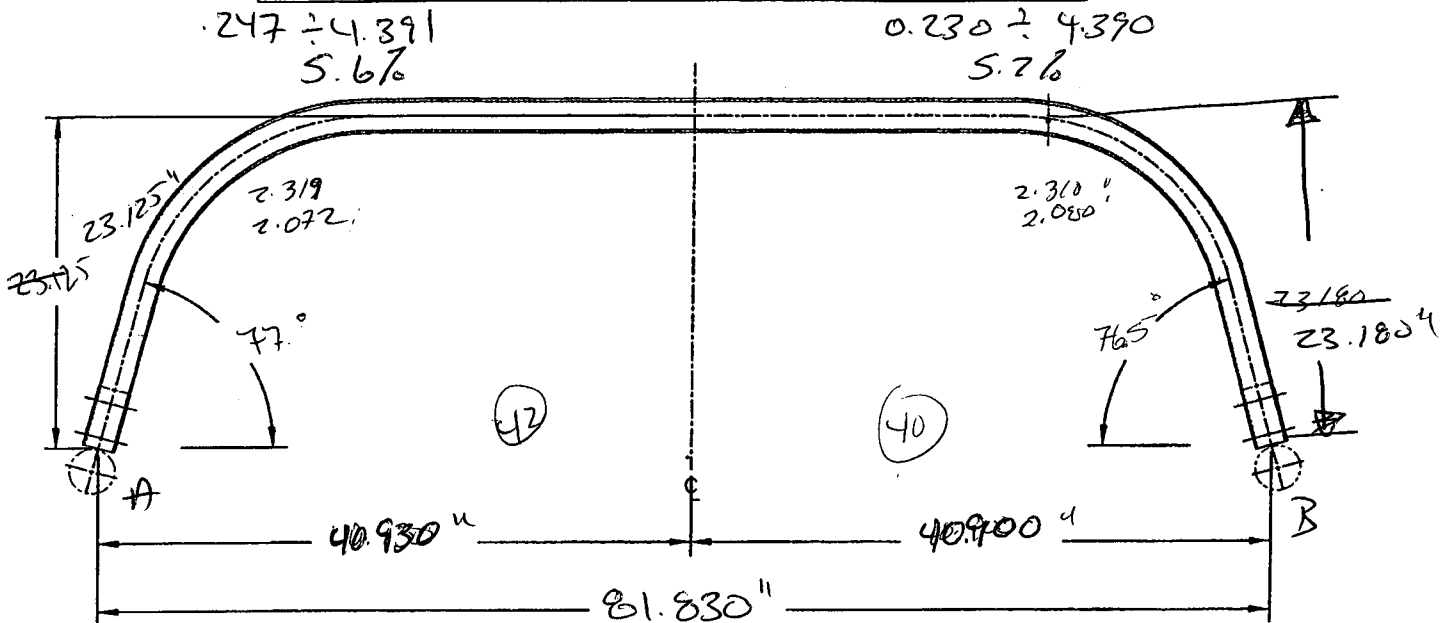
Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_  
 Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

DART AEROSPACE LTD		Work Order:	60922
Description: Crosstube High Fwd (AS350/355)		Part Number:	D350-748-101
Inspection Dwg: D350-748-141		Rev: E	Page 1 of 1

Required Dimension	Min	Max
Height	23.13	23.37
1/2 Span	40.78	41.02
Angle	75	77
Total Span	81.56	82.04



Comments
twist = $0.183''$
SIDE A = $5.6\%$ crushing @ 42 Passes
SIDE B = $5.2\%$ crushing @ 40 Passes
Acceptable distortion. 07.11.04

QC15 Inspection	S
Date	11/10/04

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

Item	Qty -141	Part Number	Description
1	X	D350-748-141	CROSSTUBE ASSEMBLY (AS 350/355 HI FWD)
2	1	D6015-125	CROSSTUBE (OR D6017-115)
3	2	D3502-1	SUPPORT
4	2	D2856-400-710	ABRASION STRIP
5	1	AELS-1032-225	INSERT
6	1	NAS1149D0363J	WASHER (OR AN960JD10)
7	2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
8	1	MS27039-1-10	SCREW

# **GENERAL NOTES:**

- MATERIAL: MANUFACTURED FROM D6015-125 OR D6017-115  
FINISHED LENGTH = 110.270±0.06
- FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2  
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- UNITS: INCHES UNLESS OTHERWISE NOTED.
- BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- IDENTIFICATION: DART PART NUMBER "D350-748-141" AND BATCH NUMBER ON INSIDE OF CUFF  
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- WEIGHT: 30.45 lbs
- PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.297 HOLE.
- BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.  
NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
- BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING. ACCEPTABLE TO VERIFY TENSILE STRENGTH BY HARDNESS TEST PER ASTM E18 TO 40-45 HRC.
- INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSSTUBE, CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO CRACKING/CHIPPING/GROOVES.
- TORQUE CLAMPS 60 TO 80 IN.-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- MAX TWIST AFTER BENDING: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.25 (ZN C1-3).

SHOP COPY  
RETURN TO  
ENGINEERING  
UNCONTROLLED COPY  
SUBJECT TO AMENDMENT  
WITHOUT NOTICE  
WORK ORDER  
NO. 66922  
PL11-03-2

RELEASED  
2011-01-18

F	ADD HRC TEST OPTION (B8-1) PER PAR 09-040, ADD TWIST LIMIT (A8-1, C1-3), ADD D6015-125 OPTION (C8-1), STOCK DIM NOW MACHINED (D1-4)	CP	10.11.23
E	REVISE GENERAL NOTES: UPDATE TO CURRENT ADD STANDARDS: RELOCATED FLAG #6 PER PAR 09-046 (ZN A6-3); TOLERANCES (ZN C6-3, D1-3)	RF	09.09.30
D	MAG. PARTICLE AND CAD PLATE AS MFD.	CP	06.10.31
C	ADD CAD PLATING	CP	06.08.14
B	ADD D6017-115 & PRIME AND PAINT	CP	06.06.30
A	NEW ISSUE	CP	06.03.31
REV.	DESCRIPTION	BY	DATE
DESIGN	9P	DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
DRAWN	9P		
CHECKED	9P	DRAWING NO.	REV. F
MFG. APPR.	9P	D350-748-141	SHEET 1 OF 4
APPROVED	9P	TITLE	SCALE
DE APPR.	9P	CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	10.11.23	COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR REPRODUCED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.	

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

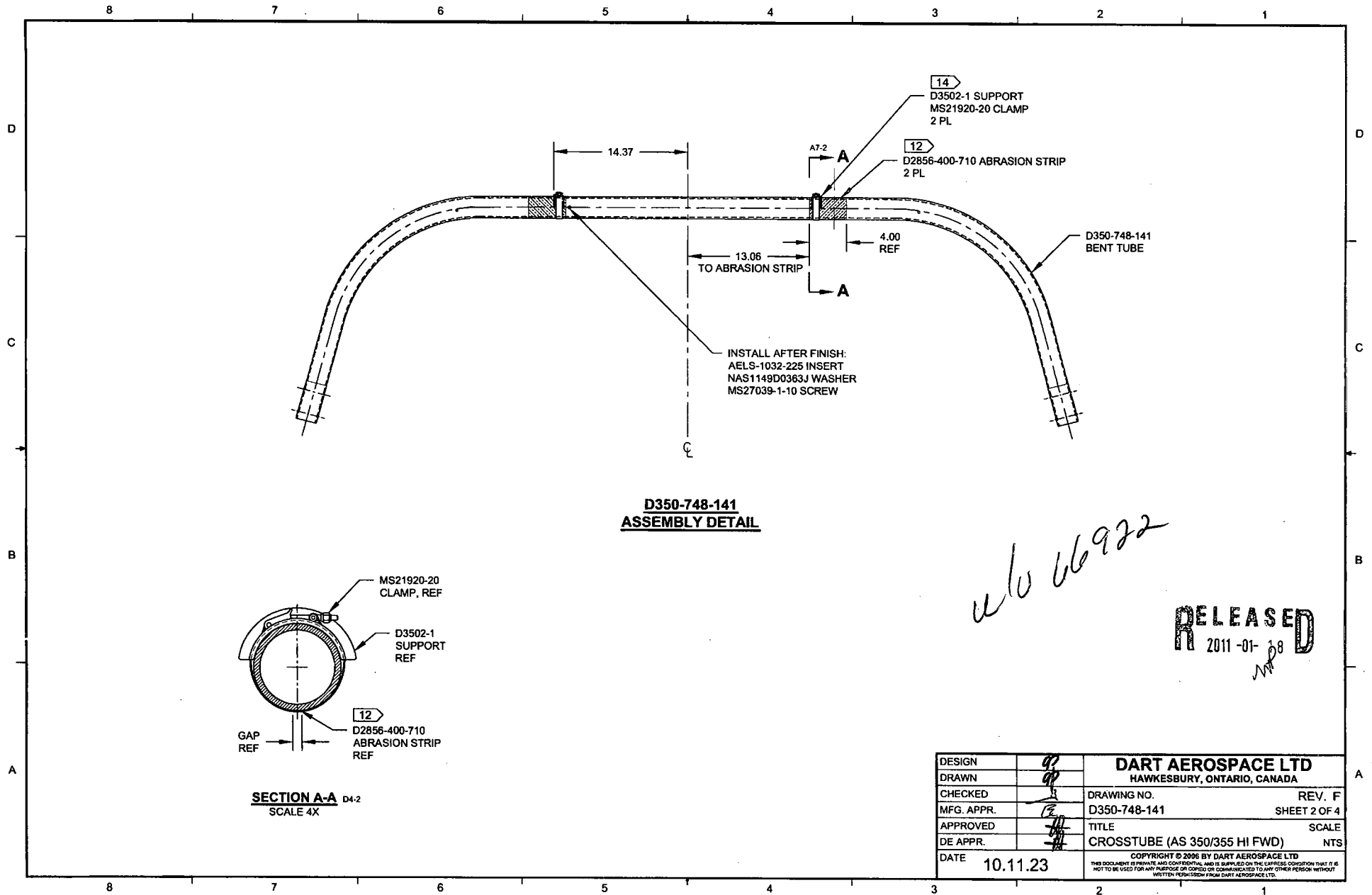
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Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries





**Dart Aerospace Ltd**

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DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

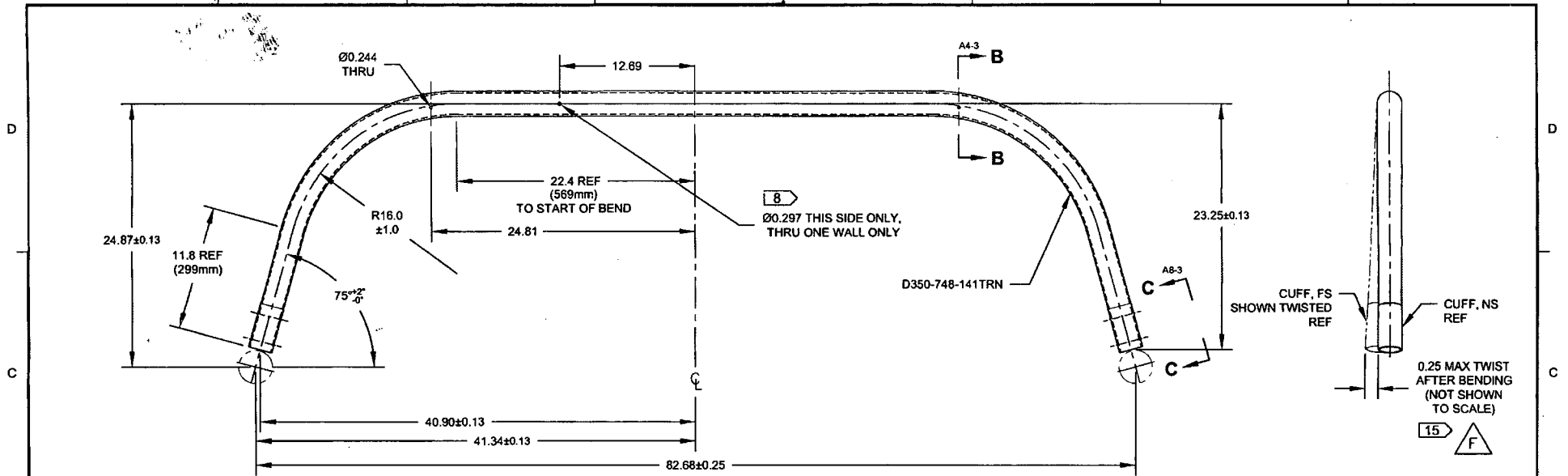
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Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

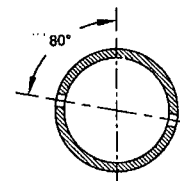
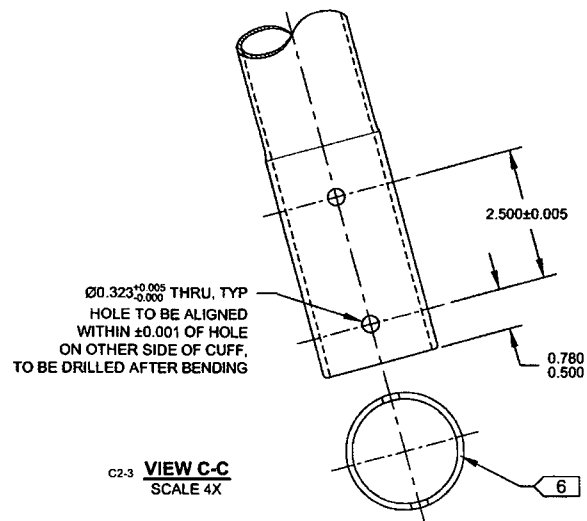
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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

8 7 6 5 4 3 2 1



**D350-748-141**  
**BENDING AND DRILLING DETAIL** 10



**SECTION B-B** D3-3  
SCALE 4X

*u/b 46922*

**RELEASED**  
2011-01-18

DESIGN	<i>DP</i>	<b>DART AEROSPACE LTD</b>	
DRAWN	<i>DP</i>	HAWKESBURY, ONTARIO, CANADA	
CHECKED	<i>B</i>	DRAWING NO.	REV. F
MFG. APPR.	<i>C</i>	D350-748-141	SHEET 3 OF 4
APPROVED	<i>H</i>	TITLE	SCALE
DE APPR.	<i>H</i>	CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	10.11.23	<small>COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.</small>	

8 7 6 5 4 3 2 1

**Dart Aerospace Ltd**

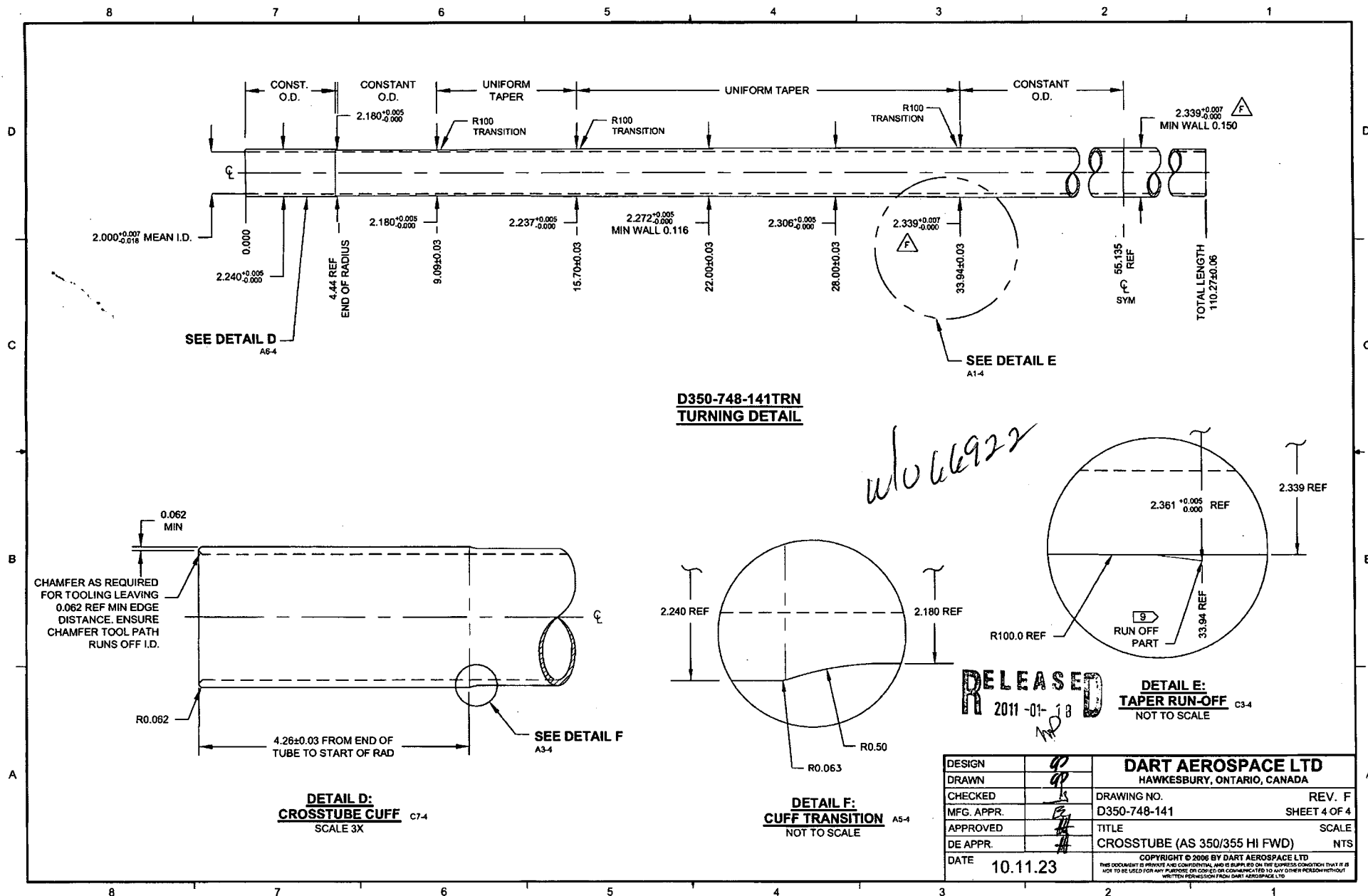
W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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**NOTE:** Date & initial all entries



**Dart Aerospace Ltd**

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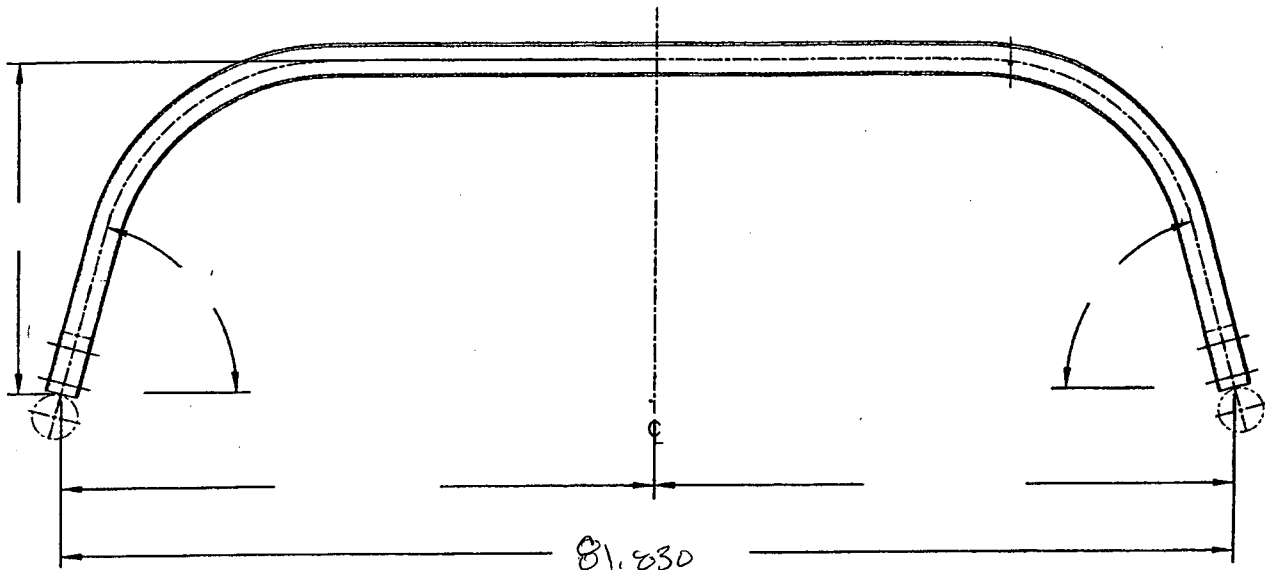
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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

DART AEROSPACE LTD		Work Order:	66922.
Description: Crosstube High Fwd (AS350/355)		Part Number:	D350-748-101
Inspection Dwg: D350-748-141	Rev: E	Page 1 of 1	

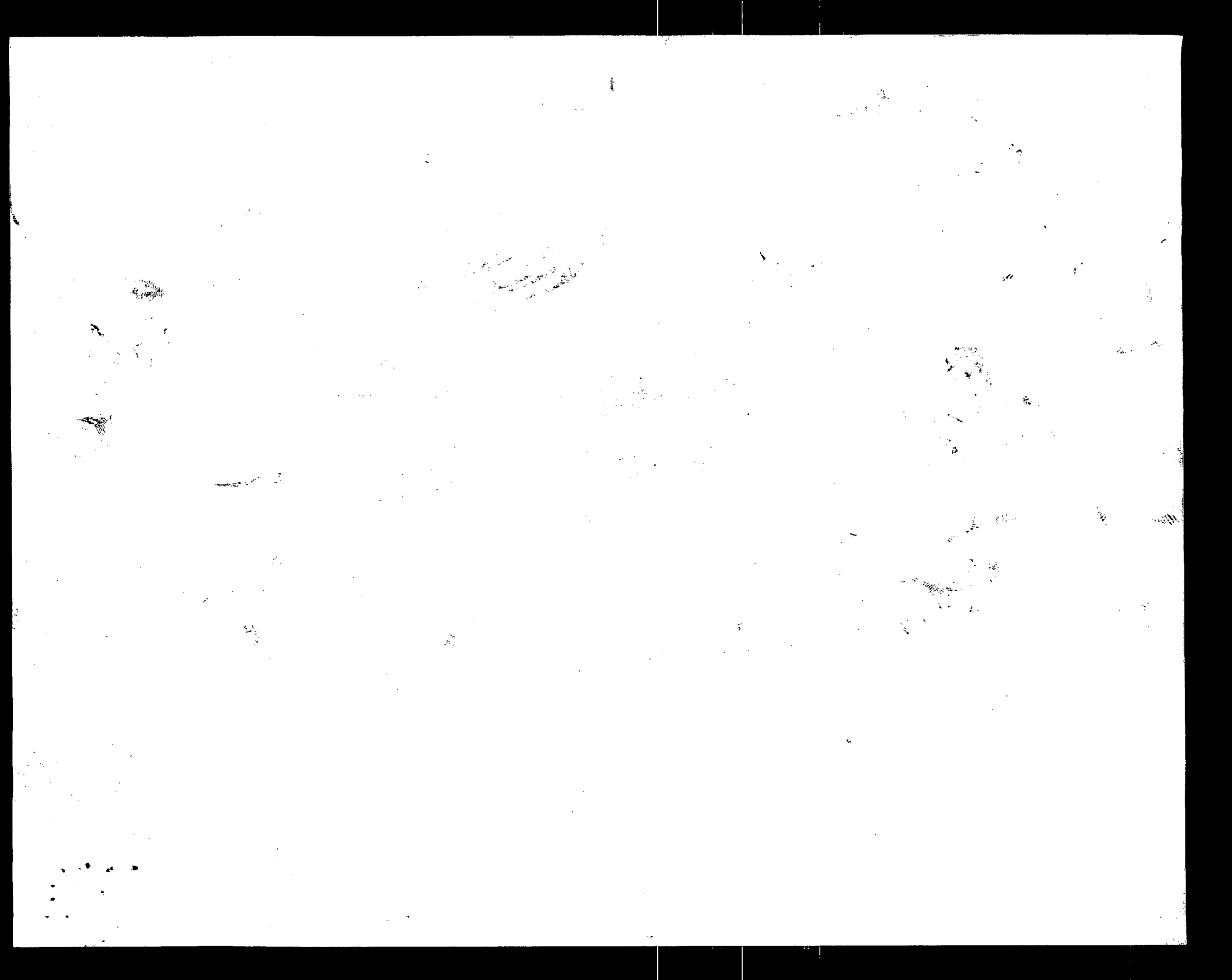
Required Dimension	Min	Max
Height	23.13	23.37
1/2 Span	40.78	41.02
Angle	75	77
Total Span	81.56	82.04



FOR stress relief only	
Comments	
...tubing 20.175"	

QC15 Inspection	S
Date	11/10/05

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	





**CERTIFICATE OF  
CONFORMANCE**

**CADORATH PLATING CO. LTD.  
2150 LOGAN AVENUE  
WINNIPEG, MANITOBA R2J-0J1**

**DATE:** Oct-28-2011

**CONSIGNEE TO:** Dart Aerospace Ltd.  
1270 Aberdeen St.  
Hawksbury, ON K6A 1K7

**W/O #:** 108674

**INVOICE #:** 57422

**CONTRACT OR  
PURCHASE ORDER # 15117**

**DESCRIPTION: SKID QTY 1**

**P/N # d350-748-101**

**S/N # B66922**

**STRESS RELIEF @ 375 DEG. 5 HRS BAKE HEAT CHART # 11-1084.  
MPI INSPECTED IAW ASTM-E-1444. CADMIUM PLATED IAW AMS-  
QQ-P-416C, TYPE 2 YELLOW, CLASS 1. HYDROGEN  
EMBRITTLEMENT @ 375 DEG. 8 HRS. BAKE HEAT CHART #11-1095.**

**CERTIFICATE: I certify that the items indicated here on have  
been inspected and tested and conform to all specifications  
and requirements detailed on the contract or purchase order.**

**Approved Inspector:**



A large, stylized handwritten signature in black ink.



## RAPPORT D'INSPECTION PAR RESSUAGE

P-11134

NT Dart Aerospace DATE 3 novembre 2011 PAGE 1 DE 2  
INTION Mue Linda Lincelle N° TRAVAIL 188-11-02386 HEURE AM ☒ PM ☐  
ESSE 1270 Aberdeen St, N° CLIENT POWO 1753597  
Hawkesbury, Ont, K6A 1K7 SITE DE TRAVAIL Dart Usine  
ACCEPTATION STD. ASTM 1417/AS1038 DATE/RÉV. 2005  
JET Crosstubes inspection (Fluorescent Penetrant)  
(S) EXAMINÉ 12 x crosstubes (5x Steel, 7x Aluminium)

DESCRIPTION DES TRAVAUX N° PROCÉDURE LT-002 DATE/RÉV. 2007 N° TECHNIQUE LT-002 DATE/RÉV. 2007

EMS See other sheet MATÉRIEL Steel - Aluminium PAISSEUR -  
RIPTION Inspection 100% Fluorescent on surface external  
on 12 x crosstubes.

## DÉTAILS DES INSPECTIONS

MODE : ☒ FLUORESCENT ☐ VISIBLE ☒ LAVABLE À L'EAU ☐ MÉTHODE DISSOLVANT ☐ PRÉ-ÉMULSIONNANT  
QUE : Magnaflux LUM. NOIRE S/N 16440 ☒ PUISS. > 1000  $\mu$  W/cm<sup>2</sup> ☐ AMBIANT < 2 fc  
ÉTRANT : 2498 ZL 67 TEMPS PÉNÉTRATION MIN. 10 MIN. ÉQUIP. LUMIÈRE ☐ LAMP. POCHÉ ☐ LAMP. CULASSE ☐ PUISS. > 100 fc @ SURFACE  
OLVANT PÉNÉTRANT H2O TEMPS SÉCHAGE MIN. > 10 MIN. AUTRES Macale Labino  
ILATEUR SKD S2 TEMPS PÉNÉTRATION MIN. 10 MIN. MÈTRE LUM. N/S DATE CAL DUE  
RÉVÉLATEUR ☒ NON AQUEUX ☐ AQUEUX ☐ SEC

## SURFACE INSPECTÉE

DITION SURFACE ☐ MEULÉE ☐ SOUDEE ☐ MACHINÉE ☐ GRENAILLÉE ☒ MÉTAL PROPRE  
PÉRATURE SURFACE ☐ < -4°C/20°F ☐ -4°C/20°F DE 10°C/50°F ☒ 10°C/50°F DE 52°C/125°F ☐ > 52°C/125°F

RÉSULTATS- ☐ MÉTRIQUE ☐ IMPÉRIAL

See other sheet  
For Results

11/11/03

ue des Services  
nte selon laquelle le Groupe Acuren Inc. exécute les services ne concerne que les énoncés par écrit. En aucune circonstance ces services ne s'étendent au-delà de l'exécution des services demandés. Il est entendu que toutes les  
ptions, les observations et les expressions d'opinions faites par Acuren reflètent les opinions ou les observations de l'entreprise fondées sur l'information et les hypothèses fournies par le propriétaire/opérateur, et elles ne constituent  
s déclarations ou des garanties ou ne peuvent être interprétées comme constituant. Le Groupe Acuren Inc. n'assume aucune des responsabilités du propriétaire/opérateur, et le propriétaire/opérateur conserve la responsabilité  
des décisions prises en matière d'ingénierie, de fabrication, de réparation et d'usage à partir de l'information ou des données fournies par Acuren en rapport avec les services décrits dans les présentes ne peuvent excéder le coût des  
s rendus.

## e de Diligence

l'exécution des services, le Groupe Acuren Inc. applique le degré de diligence, le soin et la compétence normalement exercés dans des circonstances semblables par d'autres fournisseurs de ce type de services opérant dans la même  
é ou dans une localité similaire. Aucune autre garantie, implicite ou explicite, n'est faite ou voulue par le Groupe Acuren Inc.

## NATURES

RÉSENTANT Ran Tiffey MOULÉ Pierre-Luc Dabour FTJ #  
HNICIEEN (SIGNATURE) Pierre-Luc Dabour SIGNATURE Tan Tiffey RAPPORT RÉVISÉ PAR:  
A (MOULÉ): Pierre-Luc Dabour 1<sup>ER</sup> TECHNICIEN Pierre-Luc Dabour 2<sup>EME</sup> TECHNICIEN  
ONGC NIVEAU 2 SNT NIVEAU 2 ONGC NIVEAU 2 SNT NIVEAU 2  
ONGC N° REG. 12205 ONGC N° REG. 12205

H-3044

BLANCHE - COPIE DU CLIENT

JAUNE - COPIE DU BUREAU

ROSE - COPIE DU TECHNICIEN

OR - COPIE DU BUREAU

PT Décembre 2005



## RAPPORT D'ESSAI NON DESTRUCTIF

(SUITE)

RAPPORT #

P 11134

PAGE 2 DE 2

CLIENT	DART AEROSPACE	DATE	2 novembre 2011	HEURE	AM	PM
ATTENTION	Mme Linda Lucelle	NO. TRAVAIL ACUREN	188-11-02386			
RÉSULTATS	( ) METRIQUE ( ) IMPÉRIAL					

STEEL Crosstubes:

Work order ID	Item ID	D350-748-101
1 " " " 66922	" " " 74646	" " " "
2 " " " 66921	" " " "	" " " "
3 " " " 66924	" " " "	" " " "
4 " " " 74658	" " " "	" " " "

Aluminium Crosstubes:

Work order ID	Item ID	D 212-664-101
1 " " " 75603	" " " 75604	" " " "
2 " " " 75800	" " " "	D 212-664-207
3 " " " 75801	" " " "	" " " "
4 " " " 75985	" " " "	D 212-664-201
5 " " " 75417	" " " "	D 412-664-203
6 " " " 75416	" " " "	" " " "

- All the Crosstubes (12) Accepted
- No linear indication as found

## Étendue des Services

L'entente selon laquelle le Groupe Acuren Inc. exécute les services ne concerne que les énoncés par écrit. En aucune circonstance ces services ne s'étendent au-delà de l'exécution des services demandés. Il est entendu que toutes les descriptions, les observations et les expressions d'opinions faites par Acuren reflètent les opinions ou les observations de l'entreprise fondées sur l'information et les hypothèses fournies par le propriétaire/opérateur, et elles ne constituent pas des déclarations ou des garanties ou ne peuvent être interprétées comme constituant. Le Groupe Acuren Inc. n'assume aucune des responsabilités du propriétaire/opérateur, et le propriétaire/opérateur conserve la responsabilité entière des décisions prises en matière d'ingénierie, de fabrication, de réparation et d'usage à partir de l'information ou des données fournies par Acuren en rapport avec les services décrits dans les présentes ne peuvent excéder le coût des services rendus.

## Norme de Diligence

Dans l'exécution des services, le Groupe Acuren Inc. applique le degré de diligence, le soin et la compétence normalement exercés dans des circonstances semblables par d'autres fournisseurs de ce type de services opérant dans la même localité ou dans une localité similaire. Aucune autre garantie, implicite ou explicite, n'est faite ou voulue par le Groupe Acuren Inc.

## SIGNATURES

REPRÉSENTANT  
À LA CLIENTÈLE

TECHNICIEN (SIGNATURE)

NAME (MOULÉE):

NIVEAU CGSB

No. ENREG. CGSB

2 NIVEAU SNT

12205

NIVEAU CGSB

No. ENREG. CGSB

2<sup>e</sup> TECHNICIEN

NIVEAU SNT

FTJ #:

RAPPORT  
REVISÉ PAR:

NOM

INITIALES